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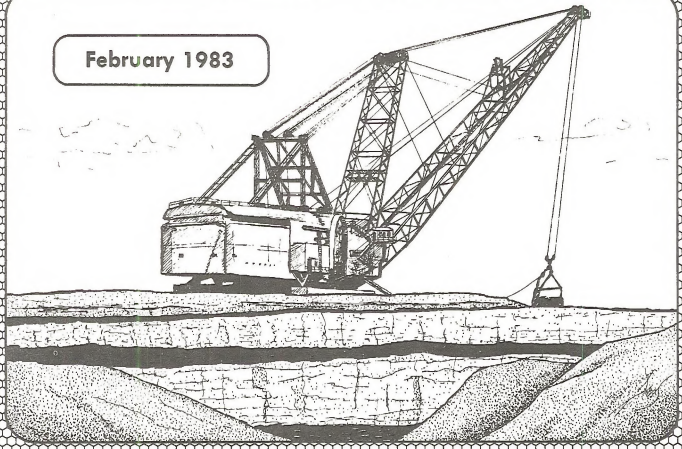
COLSTRIP AREA C

February 1983



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POWDER RIVER RESOURCE AREA TRACT PROFILE
COLSTRIP AREA C

PART I: SITE-SPECIFIC ANALYSIS OF THE COLSTRIP AREA C COAL LEASE TRACT

By Bureau of Land Management

PART II: TRACT SUMMARY REPORT, COLSTRIP AREA C

By Resource Evaluation

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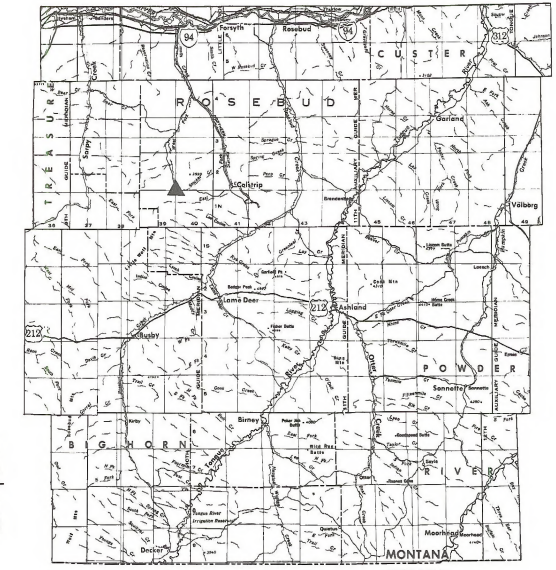
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

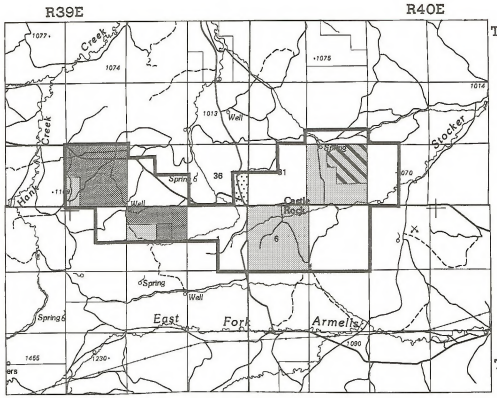
PART I

Site-Specific Analysis
Colstrip Area C Coal Lease Tract
Rosebud County, Montana

Miles City District Office
Miles City, Montana

February 1983


Forsyth
Rosebud
CUSTER
ROSEBUD
TREASURE
Colstrip
Garland
Volborg
Lame Deer
Ashland
Busby
POWDER
Sonnette
Birney
BIGHORN
RIVER
Decker
Moorhead
MONTANA
WYOMING
N
MONTANA
1 0 1 2 3 4
Scale In Miles
Tract
COLSTRIP AREA C
LOCATION MAP



COLSTRIP AREA C

- Meets BLM Further Consideration for Coal Leasing Requirements
- Existing Federal Coal Lease
- Leaseable With Stipulation
- Existing State Surface and Subsurface Mineral Leases
- Tract Boundary

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to offer for competitive lease a 5,136-acre tract of land in Rosebud County, Montana. The tract, which contains 95.13 million tons of recoverable coal of which 0.3 million tons are known to be leased. This comprises an area identified by the Resources Evaluation Division of BLM as an economical mining unit for the development of a 17-year strip-mining operation. It is located seven miles west of Colstrip, Montana. The maps preceding this page show the general location of the tract. Attachment A to Part II gives a legal description.

In preparing to offer this tract, personnel from the BLM, Miles City District, inventoried to determine the site specific resource values and then analyzed the potential environmental effects from coal development on this individual tract. Previous planning included application of surface owner consultation, multiple use and unsuitability criteria (43 CFR 3461). Any new findings of unsuitability are reflected in the delineation and development proposal of the tract described in this profile.

The tract contains, in place, 80.97 million tons of federal coal, 0.53 million tons of state coal and 70.42 million tons of private (fee) coal. The 76 acres of state coal and 842 acres of federal coal are leased and will not be considered as part of the affected environment by this profile. Annual production from the mining unit is assumed would be 5.5 million tons. There may be an increase in construction personnel as this area is opened, but it is expected personnel would be transferred from existing adjacent facilities during construction. It is assumed 165 people would be employed during production.

Surface disturbance would be about 118 acres each year. A total of 2,006 acres, that area underlain by the Rosebud coal seam, would be disturbed by mining. Shop facilities for the Colstrip Area C, Block I and II Mine, are located in the southeast corner of the tract. Approximately 100 acres would be disturbed by this facility. Additional surface would be disturbed by associated mining and reclamation activities. Railroad access or a conveyor belt system would disturb approximately 49 to 73 acres. More specific information on the proposed mining operation is available in Part II, "Tract Summary Report," prepared by Resources Evaluation.

It is assumed that proper mining and reclamation would be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement (30 CFR 700-899); Environmental Protection Agency (40 CFR 0-399); Department of the Interior's coal management program regulations (30 CFR 211, 43 CFR 23, and 43 CFR 3400); and the regulations of the Montana Department of State Lands.

CHAPTER I
AFFECTED ENVIRONMENT

GEOLOGY AND TOPOGRAPHY

Geology

The rock exposures are all within the Paleocene Tongue River Member of the Fort Union Formation. These rocks consist of sandstones, siltstones, and some shales. The regional rock dip is about one degree southeasterly. Small faults with throws of up to 50 feet may be present. No known geologic hazards exist in the tract.

Several coal seams are exposed within the tract. Except for the twenty-plus foot thick Rosebud seam, the other seams are six feet or less in thickness. The Rosebud seam thickness ranges from 21 to 29 feet, with an average of 23.6 feet. Overburden ranges from zero to 345 feet thick. The Rosebud coal ranks as subbituminous C, at 8,400 BTUs. It has a 0.94% sulfur and 9.83% ash content per pound for the federal uncommitted coal. Estimated coal tonnage is 73.8 million uncommitted and 21.3 million committed.

The McKay coal seam lies 50 to 120 feet below the Rosebud seam. Its thickness ranges from 6 to 8.5 feet, averaging 7.4 feet thick. This coal ranks as subbituminous C at 8,400 BTUs per pound. Contents for sulfur and ash are 1.41% and 9.1% per pound, respectively.

About 200 acres of Rosebud scoria are present. Most of it is in the northern tract portion, near where the Rosebud seam would outcrop.

If any gravel deposits are present, they are small and not too significant. Other than scoria and possibly gravel, probably no other saleable materials are present.

Other than coal, the only other potential leasable minerals are oil and gas. Only three plugged and abandoned wells have been drilled within a six-mile tract boundary radius. No wells have been drilled within the tract.

There are no known locatable valuable mineral deposits within the tract.

Paleontological material is probably insignificant. Probably present are leaf impressions and some freshwater shell fossils. No known valuable fossils are present in the tract.

Topography

The tract elevations range from a coulee low of about 3,370 feet to a hilltop high of 3,985 feet above sea level.

The tract consists primarily of gently rolling to rolling terrain, drained by broad, gently sloping coulees.

The tract's east half is drained by Stocker Creek, the west half by the West Fork of Armells Creek. In the northeastern part of the tract, a small ridge and hill line separates the drainages of Stocker Creek and the West Fork of Armells Creek. These hills range up to 100 feet high.

The West Fork of Armells Creek flows north across the center of the tract. Near the southern boundary, the creek bends, roughly paralleling the southern boundary westward for about two miles. Adjacent, along the north side of the creek and within the southwest corner of the tract, is a high, steep hill mass. These hills are 150-200 feet high.

SOILS

Soils are composed of deep loamy and clayey (Havre, Harlem, Glendive) soils on nearly level (0-2%) flood plains on intermittent streams; deep loamy (Floweree, Lonna, Yamac), sandy (Busby) and moderately deep loamy (Delpoint) soils on moderately sloping to strongly sloping (4-15%) side slopes; and shallow (Blackhall, Cabbart, Yawdim) soils on moderately steep to very steep side slopes and ridges.

Many mapping units throughout the coal area occur as complex, variable patterns of deep, moderately deep and shallow soils, some of which include rock outcrops.

The soils data is from the Rosebud County Order II soil survey (Soil Conservation Service) maps and soil description sheets.

WATER RESOURCES

Groundwater

Water-bearing strata underlying this tract, when listed in order of diminishing importance, include sub-McKay, Rosebud overburden, Rosebud coal, Valley fill material (alluvium/colluvium), McKay coal, and Rosebud/McKay interburden.

Valley fill materials are generally less than 40 feet thick. Typical storage coefficients range from 0.1 to 0.3. Transmissivity and hydraulic conductivity values are higher for valley fill materials than for any of the other water bearing strata in this area. Transmissivity values range from 2,200 to 50,000 gallons per day per foot (gpd/ft) with an average value of 18,900 gpd/ft. Mean hydraulic conductivity is 104 feet per day (ft/day). Present quality of groundwater has not been affected by human activity. Total dissolved solids (TDS) concentration for Stocker Creek valley fill water ranges from 2,000 to 4,000 milligrams per liter (mg/l).

Overburden, like valley fill material is an unconfined aquifer over most of the area. Transmissivity varies widely for overburden, ranging from 1 to 79,000 gpd/ft. Storage coefficients range from 0.006 to 0.03. A mean hydraulic conductivity value of 0.468 ft/day indicates that the overburden has a very low rate of water flow through it. In some places the overburden includes clinker. TDS levels range from 400 to 2,500 mg/l.

The Rosebud coal is confined over most of the area. Transmissivity ranges from 3 to 12,700 gpd/ft with a mean of 526 gpd/ft. This coal bed has a storage coefficient of 0.000015. Regional flow for this aquifer originates in this vicinity and moves south, southeast and east. Faults occur in the area, but do not appear to significantly change lateral direction of flow. Some of the best quality ground water in this area is found in the Rosebud coal aquifer. TDS concentrations range from 400 to 6,500 mg/l. Concentrations in the higher end of the range come mostly from the western portion of Area C.

Rosebud/McKay interburden is an aquifer with minimal water production capabilities, low transmissivities, and medium water quality.

McKay coal as an aquifer acts very similar to Rosebud coal, except that it is thinner and consequently transmits much less water.

The regional sub-McKay consists of sandstone and sandy clays. Transmissivity values range from 90 to 3,200 gpd/ft. About a 30-foot thick layer of clay exists at the top of the sub-McKay, separating its flow from the McKay coal aquifer. TDS concentrations generally occur within the range of 1,000 to 3,000 mg/l.

Groundwater withdrawn in this area is used primarily for livestock with some used for domestic water supplies. Approximately 36% of the wells are completed in the sub-McKay, 30% in Rosebud overburden, 10% in Rosebud coal, and less than 10% in valley fill and McKay coal. Ephemeral springs in the area are also used for stock watering. Nine stock or domestic wells exist within the tract as well as two springs.

Surface Water

No perennial flows exist. The area is drained by two intermittent streams, Stocker Creek and West Fork Armells Creek, and their ephemeral tributaries. Intermittent streams reflect the influence of bedrock and structural control in their channel courses. Intermittent streams flow within alluvial channels, but ephemeral tributaries are developed and flow primarily on bedrock. Low flow for all streams is zero cubic feet per second (cfs). When streamflow takes place, a typical range of flows is 0.01 to 28 cfs. Ten-year flood magnitude for Stocker Creek at its mouth is 415 cfs. Sediment yields range from 0.11 to 0.29 acre-feet per square mile per year and are significantly below average basin yields.

Five stock ponds are shown in the tract on topographic maps. Two of these are perennial. More may have been constructed since these maps were printed.

Surface waters of Stocker Creek are very hard and have a very high salinity hazard most of the time, with dissolved-solids concentrations usually above 2,500 mg/l. Stocker Creek water is used for stock watering only. Total dissolved solids (TDS) concentrations of stock pond water during spring runoff range from 300 to 2,000 mg/l; concentrations from 2,000 to 4,000 mg/l occur during the summer and fall months. Water flowing from springs is highly mineralized, with TDS concentrations of around 5000 mg/l. West Fork Armells Creek water is typified as sodium sulfate and as calcium bicarbonate at higher flow. TDS concentrations range from 383 to 5,710 mg/l with most falling within 4,000-5,000 mg/l. West Fork Armells Creek water is suitable for irrigation only at times of high runoff. During low flows, sodium and salinity are too great. TDS is not too high for cattle, but sulfate concentrations are near values considered restrictive.

Alluvial Valley Floors and Floodplains

Potential alluvial valley floors and floodplains have not been identified in this tract.

VEGETATION

The Colstrip C coal tract consists of approximately 4,218 surface acres. Of that, 2,994 surface acres (70.98%) of the area is rangeland. The balance is 1,224 acres (29.02%) of cropland. The rangeland consists of four dominant range sites. These range sites are silty 575 acres (19%), sandy shallow 390 acres (13%), silty-shallow, shallow clay 462 acres (15%), sandy 908 acres (31%) of the coal area. Other range site complexes total 659 acres (22%) of the coal area. Within these range sites, there are varying production yields (pounds per acre) and condition classifications. The silty site produced 146 AUMs (22%), sandy shallow 88 AUMs (13%), silty-shallow shallow clay 98 AUMs (14%), sandy 229 AUMs (34%), and other range site complexes 116 AUMs (17%) on the coal area. There are approximately 677 AUMs being produced per year on the coal area in its present condition.

AGRICULTURE

Of the 4,218 surface acres, only 58.9% (2,484 acres) of the area is suitable for cropland (Class III and IV land). Of that amount only 29.02% (1,224 acres) is currently used as cropland. The balance is Class VI through VIII, which is only suitable for rangeland, watershed and wildlife. There is no land suitable for irrigation.

Agricultural operations are mainly livestock with small areas of hay (alfalfa or grass-legume), small grains and tame pasture (see Table CC-0). Hay or small grains are mainly grown for livestock feed during the winter months. Some small grains are grown for sale.

Currently 167 acres of Class III land (3.9%) are planted to wheat or barley, which produce approximately 2,873 bushels of wheat or 4,083 bushels of barley per year under dryland conditions. Wheat and barley production is based on the assumption that 50% of the cropland is in summer fallow yearly.

Approximately 1,057 acres of Class III and IV land (25.06%) are in tame pasture, which will provide approximately 1,033 AUMs per year under dryland conditions.

In addition, there are approximately 1,260 acres of Class III and IV land (29.88%) which are not presently cropped, but are suitable for cropland. This land could produce approximately 1,137 tons of hay or 18,136 bushels of wheat under dryland farming operations. Estimated wheat production is based on the assumption that 50% of the cropland is in summer fallow yearly.

This land is currently being utilized as range land.

OWNERHSIP AND LAND USE

Table CC-1 displays the ownership of surface and coal in the Colstrip Area C tract. Within this tract 4,698 acres are held by energy related landowners.

A total of 322 acres are owned by a non-energy related private landowner and account for 13% of his holdings within approximately two miles of the perimeter of the tract. The United States owns the coal in these 322 acres.

TABLE CC-1
OWNERSHIP OF SURFACE AND COAL IN THE COLSTRIP AREA C TRACT

	Acreage of Surface Owned	Acreage of Coal Owned		
		Leased	Unleased	Total
Private Landowners	5,020			2,737
United States	40	842	1,481	2,323
State of Montana	76	76		76

TABLE CC-0
COLSTRIP C COAL AREA
AGRICULTURAL LAND USE TABLE

PRESENT USE OF LAND	ACRES	% OF AREA	LAND CLASS CAPABILITY NON-IRRI-GATED	LAND CLASS CAPABILITY IRRI-GATED	PREDICTED AVERAGE YIELDS WHEAT DRY LAND (BU)	WHEAT IRRI-GATED (BU)	BARLEY DRY LAND (BU)	BARLEY IRRI-GATED (BU)	OATS DRY LAND (BU)	OATS IRRI-GATED (BU)	ALFALFA DRY LAND (TON)	ALFALFA IRRI-GATED (TONS)	TAME HAY DRY LAND (TONS)	PASTURE DRY LAND (AUMS)	PASTURE IRRI-GATED (AUMS)
Private															
Cropped (Tame Pasture)	732	17.35	III	-	23,809	-	33,790	-	-	-	722	-	666	722	-
(Tame Pasture)	325	7.71	IV	-	9,104	-	12,658	-	-	-	311	-	254	311	-
Total	1,057	25.06	-	-	32,913	-	46,448	-	-	-	1,033	-	920	1,033	-
Cropped (Small Grains)	167	3.96	III	-	5,745	-	8,166	-	-	-	167	-	136	167	-
	167	3.96	-	-	5,745	-	8,166	-	-	-	167	-	136	167	-
Total															
Total Land Cropped	1,224	29.02	-	-	38,658	-	54,614	-	-	-	1,200	-	1,056	1,200	-
Private															
Non Cropped (Range)	560	13.28	III	-	17,515	-	24,673	-	-	-	550	-	511	550	-
(Range)	700	16.60	IV	-	18,756	-	25,685	-	726		587	-	485	587	-
Total	1,260	29.88	-	-	36,271	-	50,358	-	726	-	1,137	-	996	1,137	-
Total Land Suitable for Cropland	2,484	58.90	-	-	74,929	-	104,972	-	726	-	2,337	-	2,052	2,337	-

In 1979, 1980, and 1981, the BLM conducted surveys of the private landowners overlying federal coal in the Colstrip Area C tract. Of these private landowners, only one is qualified and he is in favor of having the coal mined.

There are three occupied dwellings located on this tract. Western Energy owns the property and improvements of two of these but has not yet reached an agreement with the owner of the third dwelling (located in Section 6, T1N R40E).

WILDLIFE

A variety of migratory birds of high federal interest migrate through or nest in the area of the tract (BLM 1981). None of these species nests on the tract.

There are two sharp-tailed grouse leks on the tract. One is over private coal, and the other is over federal coal. The lek over federal coal met Criterion 15 for being unsuitable, but was found to be suitable for mining with the stipulation that it can be leased and mined if the State of Montana agrees (BLM 1981).

There are no fisheries or known fish species of special concern on the tract.

CULTURAL RESOURCES

All 4,239 surface acres (100%) have received inventory, including surface over all federal mineral estate in the tract. Twenty sites are presently recorded in the tract, of which 13 sites are above federal mineral. Unsuitability Criterion 7 has been applied to 9 of 13 sites over federal mineral: 24RB335 is eligible and nominated to the National Register of Historic Places; 24RB 288 and 328 are determined eligible; five sites, 24RB 301, 302, 326, 329, 331, are determined not eligible, and there is insufficient information to make a determination of eligibility for four sites, 24RB 286, 287, 290 and WE-15. Information is not available for 24RB 292, 308, 310 and 331.

RECREATION

This tract lacks public recreational developments and opportunities. The tract has access, but private landowners control the surface. Hunting is probably the only recreational activity on this tract.

VISUAL RESOURCES MANAGEMENT

This tract has a grassland-timber biome with sagebrush growing in the lower elevations. The ridges have stands of conifers and the West Fork of Armells Creek has stands of deciduous trees. Existing intrusions include gravel pits, trails, public roads, fences and cultivated fields. This area lies in scenic quality Classes B and C, with the majority of the tract being the latter (having commonality of features).

CLIMATE AND AIR QUALITY

This area is influenced primarily by a continental climate. It experiences temperature extremes, convective thunderstorms in the summer, and inversions, which often predominate in the winter. July is the warmest month with Colstrip experiencing an average temperature of 71.5 degrees Fahrenheit (°F). Average maximum temperature in July is 89.2°F and average minimum is 53.8°F. Average temperature during the coldest month (January) is 21.0°F. During January, the average maximum temperature is 34.4°F and the average minimum is 7.7°F. Annual average relative humidity is 55%. Annual average precipitation is 15.8 inches. Average snowfall at Colstrip is 34.6 inches. Three-fourths of the precipitation falls during the growing season. The growing season averages only 115 days at Colstrip. Average total evaporation for May through September, determined over a five-to-ten-year period, was 40 inches. Southerly wind directions appear to predominate at Colstrip. Strongest wind speeds are from the west-southwest, while slowest wind speeds are from the east. Wind speeds in excess of 13 miles per hour occur about 10% of the time.

Although terrain offers little obstruction to dispersion of pollutants, the area experiences prolonged periods of depressed mixing heights and low wind speeds, which tend to concentrate pollutants.

Because of high particulate matter levels, an area of 120 square miles centered on Colstrip has been designated as a non-attainment area for total suspended particulates (TSP). This tract lies outside of the non-attainment area and currently experiences very low particulate concentrations on the order of 20-25 micrograms per cubic meter (mcg/m^3) based on Western Energy monitor numbers 10 and 11. Gaseous pollutants are currently so low they are not even monitored.

One Class I area, the Northern Cheyenne Indian Reservation, lies about 13 miles south of this tract. PEDCo Environmental estimated the visual range from 45 to 70 miles. The Area C, Block 1 Final EIS derived a value of 35 miles for the existing visual range.

NOISE

Existing sound levels have not been measured in this area, but they are believed to be very low, probably about 29 decibels (dBA). Noise related to man's activities is limited to occasional blasting from nearby mining operations. Apart from occasional blasting, noise is at background levels.

TRANSPORTATION FACILITIES

Montana Route 39 lies approximately seven miles to the east of Colstrip Area C tract. Two gravelled roads lie within the tract. One road is east-west and the other is north-south. These roads intersect in the center of the tract. The nearest railroad is the Burlington Northern spur at Colstrip, seven miles distant. A conveyor belt system is being developed four miles to the east of the tract to haul coal from Block I of Colstrip Area C mine to Colstrip. It is assumed this conveyor belt would also be used to transport coal from this tract.

SOCIOECONOMICS

Employment and Income

The Colstrip C coal tract is located in Rosebud County near the town of Colstrip. This town is company owned and has grown in size due to the construction of coal-fired electric generation plants. The lands involved in the tract have been used for agricultural production.

Rosebud County's market value of all agricultural products sold in 1978 was $28,997,000. The average value per farm/ranch was $82,850, which is more than $34,000 greater than the average per farm/ranch for the state. Cattle production produced the greatest value ($22,527,000) of the total market value for the county. Wheat production produced $5,034,000, followed by hay, which produced $801,000.

Rosebud County has experienced a 39% population increase in the past 10 years. This is due to the increased activity at Colstrip. (See Table CC-2.)

TABLE CC-2
POPULATION CHANGE

	1960	1970	1980	Percent Change 1970-1980
Rosebud County	6,187	6,032	9,899	-39%

Per capita income in Rosebud County is $7,930, which is less than the state per capita income of $8,652.

The Colstrip C coal tract is located near the unincorporated town of Colstrip. This town has experienced considerable growth due to construction of the Colstrip electrical generation plants. This growth was primarily financed by Montana Power Company and its subsidiaries. Much effort and planning has enabled this growth to occur without major hardships.

The nearby Northern Cheyenne and Crow Indian Reservations economies are based on jobs provided by the tribal government and Federal programs. There has been a slow shift from a subsistence to a cash economy, but most households still rely on hunting and gathering to supplement their incomes. Chronic unemployment is a serious problem.

Due to sparse population, most people, consumer goods and agricultural products move by roadways. The road network is not well developed but is generally adequate for the existing population. A loose network of county and Bureau of Indian Affairs roads provide ranchers and rural residents access to the primary and secondary road systems. These are mostly gravel surfaced, with curves and grades conforming closely to the existing terrain (Montco Mine Plan EIS draft).

Existent Attitudes

Several surveys over the past five years in the area have shown on a fairly consistent basis, that most of those interviewed are in favor of mineral development. A BLM study, conducted in 1979-1980, showed the principal reason for supporting development are national energy needs and economic growth of the region. The study also showed respondents were in favor of mining controls.

CHAPTER II
ENVIRONMENTAL CONSEQUENCES

GEOLOGY AND TOPOGRAPHY

Geology

Within the mined area, the overburden strata would be destroyed. The strata would be more homogenized, when reclaimed in the mined area.

The Rosebud seam would be removed. This would preclude future use of this coal resource. Any other coal seams present in the overburden would be destroyed. Those seams below the Rosebud would be lost to future recovery because present law precludes mining reclaimed lands.

Strata below the mined Rosebud seam would be undisturbed. Oil and gas exploration activity would be precluded during the active mining phase. Since there are no producing wells in the area, potential delays in oil and gas exploration during active mining would be insignificant.

Some Rosebud scoria might be destroyed by mining. Some scoria probably would be used for mine haul roads and other mine related activities.

Within the overburden, any paleontological resources would be at least partially destroyed. The remaining fossil material would be repositioned when the spoils are replaced.

Topography

The mined, recontoured terrain would show somewhat less relief than the current terrain. The hill mass in the northeast of the tract would be reduced and rounded off. The tract's southwest hill mass would probably remain unchanged, due to overburden thickness, which would preclude mining. The lower average postmine relief would increase water infiltration into the soil. Runoff and erosion would decrease.

For overburden, a common coefficient of expansion is about 1.18. With the Rosebud seam thickness of 23.6 feet and 131 or more feet of overburden, the postmine ground elevations would be greater than the premine elevations. Most of the mined area would have overburden of less than 131 feet. The overall average postmine elevation would be less than premine elevation.

SOILS

Impacts to soils from mining activities include: displacement of soil from wind and water erosion, change and degradation of soil structure and natural fertility, salt migration through the soil profile after reconstruction, and significant problems in revegetation and soil stabilization on steep slopes.

Disturbances of the soil would result in alterations of soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be affected by disruption of the nutrient cycle and a decrease in organic matter content within the topsoil.

The soil mapping units in the Colstrip Area C were evaluated for suitability of soil material for plant growth using USDA/SCS guidelines for "Soil Reconstruction Material for Drastically Disturbed Areas" [NSH 403.6 (a)]. These results are expressed as acre feet of soil material having good, fair and poor suitability due to its physical and chemical properties. This showed 19% (3,698 acre feet) of the area rated good, 41% (8,030 acre feet) rated fair and 40% (7,839 acre feet) rated poor as to suitability for plant growth (Table CC-3).

The wind erosion potential for the tract is rated as 29% low, 29% moderate and 42% high and the water erosion is rated as 16% low, 52% moderate and 32% high. The erosion potentials for each soil mapping unit is found in the Rosebud County Soil Series Description and Interpretations.

Areas within the tract may have poorer or better reclamation potential because of their unique soil distribution patterns. Suitable overburden materials, if available, could be used to provide additional material for more adequate reclamation. Current information demonstrates that this area has fair to poor success for reclamation.

TABLE CC-3

COLSTRIP AREA C SOIL RECLAMATION ASSESSMENT

Mapping Unit Symbol	Mapping Unit Name	Acres	Pct. of Area	Slope	Erosion Potential From Wind	Erosion Potential From Water	Suitability of Soil Material for Plant Growth (acrefeet) Good	Fair	Poor
496F	Armells-Delpoint-Cabbart	25	1	25-70	Low	High	9	22	86
12E(127E	Birney channery loam	30	1	15-25	High	Moderate	-	28	122
121E	Birney-Kirby channery loams	16	<1	4-25	Low	High	8	9	62
123E	Birney-Kirby channery loams, moist	8	<1	15-25	Low	High	4	5	31
127F	Birney-Kirby-Cabbart	16	<1	25-70	High	Low	1	13	61
13C	Busby fine sandy loam	324	8	2-8	High	Low	350	917	353
13D	Busby fine sandy loam	300	7	8-15	High	Moderate	324	849	327
132E									
134E	Busby-Twilight-Blackhall fine sandy loams	390	9	8-25	High	High	343	702	203
183E									
185E	Busby-Rock Outcrop	330	8	8-25	High	Moderate	191	1105	145
131E	Busby-Yetull	42	1	8-25	High	Moderate	34	137	29
184F	Cabbart-Yawdim-Rock Outcrop	192	5	15-70	Low	High	10	179	476
38D	Cambeth silt loam	22	1	8-15	High	Moderate	11	9	90
491C	Camborthids-Torrifluvents association channeled	53	1	0-8	Moderate	Moderate	32	136	98
21C	Chinook fine sandy loam	219	5	2-8	High	Low	948	-	147
498E	Delpoint-Cabbart-Yamac loams	32	1	8-25	Moderate	High	13	39	77
498F	Delpoint-Cabbart-Yawdim	117	3	25-70	Moderate	High	9	132	324
27A	Floweree silt loam	108	3	0-2	Moderate	Low	108	126	360
27C	Floweree silt loam	245	6	2-8	Moderate	Moderate	123	287	816
2	Havre-Harlem-Glendive, soils, channeled	44	1	0-2	High	Moderate	21	162	37
59C	Kobar silty clay loam	80	2	2-8	Moderate	Moderate	-	174	226

TABLE CC-3 (cont.)

COLSTRIP AREA C SOIL RECLAMATION ASSESSMENT

Mapping Unit Symbol	Mapping Unit Name	Acres	Pct. of Acres	Slope	Erosion Potential From Wind	Erosion Potential From Water	Suitability of Material for Plant Growth (acrefeet) Good	Fair	Poor
591E	Kobar-Yawdim-Cabbart	31	1	8-25	High	High	31	47	96
16C	Kremlin loam	139	3	2-8	Moderate	Moderate	93	58	543
37A	Lonna silt loam	15	<1	0-2	Moderate	Low	10	65	-
37C	Lonna silt loam	337	8	2-8	Moderate	Moderate	226	1,459	-
37D	Lonna silt loam	59	1	8-15	Moderate	High	40	255	-
372E	Lonna-Cabbart-Yawdim	345	8	8-25	Low	High	176	252	1,297
7E	Ustic Torriorthents	11	<1	15-35	Moderate	High	-	-	-
49A	Yamac loam	15	<1	0-2	Low	Moderate	14	19	42
49C	Yamac loam	479	11	2-8	Low	Moderate	441	599	1,356
49D	Yamac loam	4	<1	8-15	Low	High	4	5	11
492C	Yamac-Busby	7	<1	2-8	Moderate	Moderate	6	14	13
492D	Yamac-Busby	34	1	8-15	Moderate	High	31	70	63
493D	Yamac-Rentsac	66	2	2-15	Low	Moderate	39	56	147
493E	Yamac-Cabbart loams	20	<1	8-25	Low	High	9	24	57
494D	Yamac-Delpoint loams	63	2	4-15	Low	High	39	76	144
	Totals	4,218	100				3,698	8,030	7,839
	Percent of total acre feet						19%	41%	40%

WATER RESOURCES

Groundwater

Groundwater aquifers would be disrupted by mining, but replaced with spoils that would have similar flow characteristics to the original aquifers. Groundwater flow would be intercepted by the pit during mining. Discharge of water into the pit would be greatest immediately after the pit is opened and would diminish with time. Water levels in spoils would eventually reach premining levels.

Total disolved solids (TDS) concentration of water in the spoils aquifer would be approximately twice that of water in the Rosebud coal and overburden aquifers. Spoils water would follow the regional southeast flow direction and would eventually reach Cow Creek. Quality of water in aquifers underlying the Rosebud coal would generally not be affected by the placement of spoils. Water discharging at the boundaries of the mined area to streams would have no appreciable effect on surface water quality. However, water discharging from the spoils to the valley fill material would displace water in the valley fill and would increase concentrations of total dissolved solids. Spoil water would not be preferred for human consumption and irrigation, but would probably be suitable for livestock.

Existing wells and springs that would be encountered by mining would be destroyed. Fifteen wells and seven springs exist within two miles of the tract boundary and could be affected by aquifer drawdown associated with mining. Those wells and springs downgradient from spoils could experience water quality degradation. Unaffected deeper aquifers are available as replacement sources of groundwater.

Surface Water

Surface water would be affected by surface mining primarily during the mining period, when existing drainage patterns in parts of the area would be displaced, runoff would be intercepted, and existing reservoirs would be removed from the mined area. Since alluvium is likely to be drained by mining, intermittent stream flow may be slightly reduced as water infiltrates to the alluvium.

Channels might have to be diverted around the mine pit to carry their natural flows. The channelization could decrease annual and low flow rates, because of seepage loss to the pit. Peak flows should be somewhat reduced. Water discharging from the disturbed area after passing through sediment ponds would have nearly all sediment removed, thus increasing erosive capabilities of the water.

Channelization of stream courses could cause increased flow velocities, and the release of production water, including mine drainage, could alter the flow characteristics of streams. Erosion and sedimentation might increase during construction and operation of the mine, after the removal of vegetation and before its reestablishment on reclaimed areas.

Alluvial Valley Floors and Floodplains

No alluvial valley floors have been identified for this tract.

VEGETATION

If the range were in excellent condition (76-100%) and the entire area were mined, there would be an approximate loss of 804 to 1,074 AUMs. However, in its present condition, the loss would be approximately 677 AUMs. Mining of the area would temporarily eliminate opportunities for domestic livestock to occupy the surface and to utilize the forage. However, vegetative production may be better after mining (due to extensive reclamation work) and the area may produce more than the current number of AUMs per acre. There is, however, no evidence that the plant community that ultimately evolved would support higher levels of livestock grazing than the premining vegetation supported.

Additional impacts resulting from vegetative disturbances would be: (a) possible reduction of the visual aesthetics, (b) increased soil erosion, and (c) reduction in the amount of wildlife and livestock forage.

AGRICULTURE

If this area is mined, there would be approximately 2,484 surface acres suitable for cropland that would be lost for the term of mining and reclamation operations. This land could produce approximately 37,465 bushels of wheat (based on 50% land, summer fallow; 50% land, wheat) or 2,337 tons of hay annually under dryland conditions. There is no land suitable for irrigation in this tract. However, 1,224 acres (49.28%) of the suitable cropland is currently being utilized as cropland.

OWNERSHIP AND LAND USE

As a result of leasing, industrial activities would be further accelerated in an area that has two existing strip mines and the beginnings of a third. This third mine (Colstrip Area C, Block 1) is directly adjacent to the east boundary of this tract. The impacts due to the construction of new access roads, improvements and relocation of existing routes, and construction of powerlines is, therefore, expected to be low to moderate.

Assuming a right-of-way of 100 feet, a minimum of 72 acres would be disturbed in relocating the county roads that currently cross the tract.

The three occupied dwellings located on the tract would be removed if the tract is mined, causing relocation of the occupants. Since Western Energy owns two of the dwellings and is attempting to acquire the third, impacts from removal of the dwellings are expected to be minimal.

WILDLIFE

There are no threatened or endangered species on the tract. In any mine plan, special consideration for protection from disturbance should be given to raptors nesting and migrating in the area of the tract.

Mining the tract would destroy one sharp-tailed grouse lek over federal coal. Prior to leasing, a mitigation plan would have to be developed and agreed upon by the State of Montana. If not mitigated, the area would be unsuitable for mining.

Poaching and road kills have increased dramatically in areas of Montana, Wyoming and Colorado where energy development has occurred. The problem is compounded in areas where shift changes coincide with feeding periods, especially big game (Streeter, et al 1979). The same would probably occur in this area.

CULTURAL RESOURCES

If the area is mined, all cultural sites in the mine would be destroyed and sites immediately adjacent would be adversely affected by haul roads, vehicle traffic and soil erosion. Prior to any mining, sites with undetermined eligibility to the National Register must be tested. The exception to Criterion 7 for unsuitability would be applied, and eligible sites would be mitigated through data recovery, pending consultation with the State Historic Preservation Officer.

RECREATION

Mining in this tract would affect hunting because of wildlife habitat loss. The main impact from additional mining in this area would probably be off-site, because of the presence of people in the Colstrip area; thus, pressure would continue to be put upon public lands with legal access.

VISUAL RESOURCES MANAGEMENT

Visual impacts caused by mining activities would increase land disturbances. The disturbances would be in the form of railroad, powerlines, piles of overburden, equipment, shops, additional roads and other activities related to mining. These intrusions would create a contrast, new horizons and forms in this area.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action would be localized and insignificant. Reclamation would mitigate any impacts, over the long term, that surface modifications could cause to climatic conditions.

Only emissions caused by the proposed mining project are considered significant and of those emissions, only particulate matter would be of a substantial enough consequence to be considered here. Non-project sources would include those from increased population and services and emissions from other simultaneous projects in the area.

Emissions of particulate matter above background concentrations have been predicted for Area C, Block 1 of the Rosebud mine. This tract, if leased and mined, would result in additional increases in emissions above what has been predicted for Block 1 of Area C. What the addition in emissions would be is not known and cannot be determined without more knowledge than is available now (Kelts 1982). Expected impacts to air quality from mining Rosebud Mine's Area C, Block 1 are presented here to give an idea of what to expect if this tract were leased and mined.

During full coal production, the highest annual average ambient TSP concentration for locations off the mine site is estimated to be 31 mcg/m^3 (Site Specific Analysis 1981). This included the 20 mcg/m^3 background concentration (geometric mean). Non-project sources might additionally increase TSP by about 7 mcg/m^3. Total contributions yield a concentration well below the Montana standard of 75 mcg/m^3. Impacts of the project on TSP concentrations in the townsite of Colstrip would be very slight, but the impact from increases in non-project emission sources on Colstrip would be far greater. Annual-average TSP concentrations in the Northern Cheyenne Indian Reservation resulting from the project would be extremely low.

Montana also has a 24-hour standard of 200 mcg/m^3 that cannot be exceeded more than once a year off the mine site. Existing peak 24-hour TSP concentrations are around 90 to 100 mcg/m^3. Expected increase in TSP from mining would be about 38 mcg/m^3. The total concentration would be below the allowance standard. This would have an inconsequential effect on Colstrip, however non-project emissions in Colstrip would increase 24-hour concentrations there. Peak impacts on the Northern Cheyenne Indian Reservation would be very low.

Visibility reductions resulting from mining would be slight. PEDCo Environmental estimated visibility reductions from the second-highest 24-hour concentration of particulate matter. PEDCo reported a maximum decrease of 0.2 mile from their hypothetical viewing point and a maximum of 0.1 mile when looking from the Northern Cheyenne Indian Reservation.

More detailed and site specific air quality data for this tract will be forthcoming from a study underway by PEDCo Environmental. A more accurate prediction of impacts to air quality will be included in the study results.

NOISE

Among activities causing noise would be construction. A "worst case" estimate of construction sound levels would be 92 dBA at a distance of 50 feet. This would occur only if all equipment were operating in the same location. Attenuation of this sound level due to distance alone would reduce construction noise to about 34 dBA at the townsite of Colstrip. That level would not be audible above existing in-town sound levels. Colstrip is six miles away from this tract.

Combined noise level of mining activity would be about 98.3 dBA, estimated conservatively. This level would be reduced by distance alone to about 46 dBA in the town of Colstrip. Other factors involved in reducing noise over distance are ground effects, humidity, absorption by the atmosphere, refraction due to temperature and wind, and grass ground cover. Over the distance from the mine to the townsite, these would completely attenuate ground level sound transmission.

It is unlikely, except under the most adverse meteorological conditions, that the operation of mining equipment would normally be heard in the community of Colstrip. Depending upon blasting techniques employed and upon meteorological conditions, blasting noise might be audible in Colstrip, but at most it might be an occasional nuisance.

Effects of mining noises on animals is often that of dispersing them into areas away from the mine site. Experience is showing, however, that animals do become accustomed to mine noise and return to reclaimed areas with the mine still in operation. Western Energy Company has an established sharp-tail grouse area on one of their reclaimed areas and they often see deer frequenting the site. Indeed some researchers have complained of the nuisance wild animals can be in revegetation attempts (Schwarzkoph 1982).

TRANSPORTATION FACILITIES

Approximately six miles of gravel roads would have to be relocated if the tract is mined, causing low to moderate impacts. The gravel county road that provides access to this site is being relocated and upgraded in conjunction with the Colstrip Area C, Block 1 mine and, therefore, should not require any further upgrading to serve this tract, if mined.

SOCIOECONOMICS

Economics (Agriculture)

Coal development displaces some agricultural production. To evaluate this issue, it is necessary to compare the value of the agricultural production displaced with that of the coal which could be developed. The trade-off was compared two ways. One was to compare the net national value of agricultural production displaced with the net national value of coal produced. In this evaluation, it was assumed the net value of coal is 12.5% (minimum royalty rate) of the assumed market rate for coal of $10 per ton. The net value of agricultural production is the cash rent to the landowner. A "worst case" situation was assumed for agriculture, that is, the area would not be reclaimed. Since agricultural production would be lost on each acre, year after year, these losses were totalled to show losses in perpetuity. By comparison, coal output per acre would be gained only once. To place agricultural production and coal on the same time basis, it was necessary to discount the value of agricultural output lost in future time periods. Regardless of inflation, a loss in agricultural production in the future is worth less than if it were lost today, because of the time value of money. Under these assumptions, Table CC-4 shows the return to national income from coal production would be over 210 times greater than agricultural production.

Another way of comparing the trade-off between coal and agricultural resources is to determine what coal would have to sell for to equal agricultural production displaced. This avoids assuming all coal in the area could be sold for the going market value. Table CC-4 shows that coal would have to sell for only $.00209 per ton to be equal to the net agricultural value displaced.

Concern has been expressed that extensive strip mining could have an effect on the supply of agricultural land and, thus, the national food supply. To gain a perspective on this issue, the value of agricultural production to be potentially displaced by mining can be compared with the value of agricultural output in the consideration area. Table CC-5 shows mining of the federal coal in the consideration area in Rosebud County could displace 0.179% of the county's agricultural production, which had a value in 1978 of $28,997,000.

A "worst case" scenario was assumed, in the above comparison, that the area would not be reclaimed. Existing state and federal laws require the lands to be returned to the approximate original contour and be reseeded to native species. Evidence collected on current reclamation efforts suggests postmining productivity is similar to premining productivity, at least in the short term. Long term results are yet to be evaluated as reclaimed lands have not been monitored over a long period of time.

Regional Economics

Due to the uncertainty of the market for coal, it is not possible to display actual tonnage figures, employment figures and time frames for this proposed mine. If this tract is sold at a future coal lease sale, community leaders of all possible impacted communities should establish communications with the lessee at the earliest opportunity. This communication would enable leaders to have access to more exact figures and time frames. The coal company must apply for a permit to mine by furnishing a proposed mining plan to the Montana Department of State Lands. Upon approval of a firm EIS, this permit is issued.

This coal tract, if mined, would not impact the area except for eliminating agricultural production. There would not be an influx of people as mining operations would leave another area and start mining this area. There may be some small influx of people for a short period in order to extend the present conveyor system to this new area. Therefore, regional economics would not change from that presently expected.

Rosebud County would continue to collect taxes if this tract is mined. The State of Montana would also be able to collect severance taxes on production and one-half of the federal royalties from mining of federal coal. This would reach $20,987,621 if all of the federal coal is mined and sold at $10 per ton.

Employment of Crow and Northern Cheyenne Indians would remain the same as at present. Road travel on reservation roads would not change.

TABLE CC-4
COMPARISON OF VALUE OF AGRICULTURAL PRODUCTION DISPLACED
TO VALUE OF COAL PRODUCTION

	Agricultural Production						Coal Production					
Crop	Acres	Annual Ag Production	Net Value Per Unit	1/ Total Annual Net Value $	2/ Total Present Value at 10%	3/ Per Acre Loss If Mined	Federal Acres	Recoverable Tons/Acre	4/ Net Value per ton $	5/Total Present Value $	6/ Ratio to Ag Prod.	7/ Value per ton to equal Ag. Prod.
Wheat	167	2,873 bu.	$1/bu	$2,873	28,730							
Tame Pasture	1,057	1,033 AUMs	$10/AUM	$10,330	103,300	$47.35	1,481	22,674	$1.25	41,975,243	210 to 1	$.00209
Rangeland	2,994	677 AUMs	$10/AUM	$6,770	67,700							
Total	4,218			$19,973	$199,730							

1. Annual agricultural production x net value per unit
2. Total present value discounted at 10%
3. Total present value/total acres
4. 12.5% x assumed value of $10.00 per ton at mine mouth
5. Acres x tons/acre x net value per ton
6. Total present value (coal)/total present value (agriculture)
7. Agricutlural production per acre loss if mined/tons per acre

TABLE CC-5
COMPARISON OF COAL TRACT ANNUAL AGRICULTURAL PRODUCTION
TO COUNTY AGRICULTURAL PRODUCTION

WHEAT			Cattle					
Annual Prod. (Bu.)	1/ Annual Sales $	Percent of County Sales	Annual Production (AUMs)	2/ Annual Sales	Percent of County Sales	3/ Gross Annual Agr. Sales by Coal Area	4/ Gross Annual Agri Sales by County	5/ % of County Agri Production Displaced
2873	$9222	.03	1,710	$42,750	.147	$51,972	$28,997,000	.179

1. Montana Agricultural Statistics, Vol. XVIII, Dec. 81, Color World Montana Inc., Bozeman, MT
   1979 value $3.21/bushel x total bushels = annual value of wheat production.
2. AUMs ÷ 12 AUM/cow = cow units x 300 sales per cow unit = value of annual cattle production
3. Total of two annual sales columns
4. 1978 Census of Agriculture, Department of Commerce, US Printing Office, Washington, DC, June 81
5. Value of production displaced as a percentage of all agricultural production in the county

NET ENERGY ANALYSIS

A net energy analysis calculated by the BLM (W.O. 79-282) indicates that an average of 37.7 British thermal units (BTUs) would be expended to produce each pound of coal from the Colstrip C tract. In turn, a pound of coal would produce about 8,513 BTUs. The ratio of energy produced to that expended would be more than 223 BTUs to 1 BTU.

REFERENCES

SOILS

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Van Voast, Wayne A., Hedges, Robert B., McDermot, John J. 1977. Hydrogeologic Conditions and Projections Related to Mining Near Colstrip, Southeastern Montana. Montana Bureau of Mines and Geology Bulletin 102.

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U.S. Department of Interior, Bureau of Land Management, 1981. Powder River Resource Area Management Framework Plan Amendment Draft. BLM, Miles City, MT.

RECREATION AND VISUAL RESOURCE MANAGEMENT

USGS Quadrangle Maps

Photos, South Rosebud Planning Unit, 1974 Scale: 1:80,000

Powder River Resource Area MFP Amendment, Bureau of Land Management, Miles City District, May 1982.

COLSTRIP AREA C UNSUITABILITY SUMMARY

UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used	Additional Data Needed	Comments
1. Federal land systems	No			
2. Rights-of-way and easements	No			
3. Buffer zones for roads, buildings, etc.	Yes	No, Yes		Cannot apply exception to county roads until agreement is reached by responsible parties. Have been applied to two dwellings
4. Wilderness study areas	No			
5. Scenic areas	No			
6. Land used for scientific study	No			
7. Historic lands and sites	Yes	Yes		Further information is needed on 8 sites to determine if they are eligible for National Register listing.
8. Natural areas	No			
9. Federally listed endangered species	No			
10. State listed endangered species	No			
11. Eagle nests	No			
12. Eagle roosts and concentration areas	No			
13. Falcon cliff nesting sites	No			
14. Migratory birds	No			
15. State high-interest fish and wildlife	Yes			A sharp-tailed grouse lek was identified but not found unsuitable. Can be leased with mitigation stipulation
16. Floodplains	No			
17. Muncipal watersheds	No			
18. National Resource Waters	No			
19. Alluvial valley floors	No			
20. State proposed criteria	No			

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
GEOLOGY & TOPOGRAPHY					
Topography	Two hill masses and rounded terrain with two major coulees	One hill mass reduced to gently rolling terrain, other terrain made more gentle	Moderate	Good	
Geology					
Locatables	No claims	Delay for potential prospecting	Low	High	
Leasables	No oil and gas wells drilled within 6 miles of boundary	Delay for potential future exploration	Low	High	
Saleables	About 200 acres of Rosebud scoria present	Some destruction and use of scoria by and for mining	Low to moderate	Moderate	
Paleontological	Some fossil leaves and freshwater shells	Mining would destroy some fossils, reposition others in the spoils	Low	Low	

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COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
SOILS	Thirty-five mapping units have been identified in the tract. These soil units may be found along valley bottoms, drainages, sideslopes and ridgetops.	There would be displacement of soil by water and wind erosional forces; change in soil structure and natural fertility and significant problems in revegetation and stabilization on steep slopes.	Moderate to High	Data reliability is 80% from the Rosebud County Soil Series Descriptions and Interpretations. Better soils in the bottomlands are more accurately mapped than those on the rangelands and steep-sided slopes.	

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SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
WATER RESOURCES					
Groundwater					
Occurrence	Nine wells exist in tract. Static water levels range from 7 to 113 feet. Two springs are also present	Destruction of existing wells and springs		There may be more wells on tract.	Supplies could be replaced by deeper wells at considerable expense
Quantity	10 gallons per minute				
Conductance	243-6,157 micromhos per centimeter	Approximately twice what is in overburden and Rosebud coal aquifer water presently		Good	
Dissolved Solids	2,000-4,000 mg/l for alluvium. 400-6,500 mg/l for bedrock aquifers.	Approximately twice what is in overburden and Rosebud coal aquifer water presently		Good	
pH	7.4 - 8.8	Lower in spoils aquifer		Good	
Importance for homes or towns	Possibly some domestic use	Loss of present supply	Minor		

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COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Importance for Industry	Nil				
Importance for livestock and wildlife	Primary use	Loss of present supply	Moderate		
Importance for agriculture	Nil				
Surface Water					
Occurrence	Only intermittent and ephemeral streams and five known stock ponds	Removal of reservoirs during mining	Minor		
Quantity	Streamflow of 0.01-28 cfs				
Conductance	765-7,100 micromhos/cm	Possible increase during mining	Minimal	Good	
Dissolved Solids	383-5,710 mg/l	Possible increase during mining	Minimal	Good	
pH	7.4-8.9	Little change		Good	

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COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Importance for homes or towns	Nil				
Importance for Industry	Nil				
Importance for livestock and wildlife	Primary Use	Loss of some supplies during mining	Moderate		
Importance for agriculture	W. Fork Armells Cr. okay for flood irrigation during high flows	Could deteriorate due to mining	Moderte		

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
VEGETATION	Range Sites:(Acres) Silty 575 Sandy shallow 390 Si. shallow-Sh-Clay 462 Sandy 908 Other 659 Total 2,994	Acres being disturbed Silty 575 Sandy shallow 390 Si. Shallow, Sh. Clay 462 Sandy 908 Other 659 2,994	High - - - - Long term elimination of the natural vegetation mosaic and species diversity	Good	Reclamation of ponderosa pine not yet proven
Animal Unit Months	677 AUMs	High	Loss of 677 Aums High	Good	
Animal Unit Months if range is in excellent condition 76-100%				Good	76% 804 AUMs 100% 1074 AUMs
Threatened Endangered or Noxious species	There are no threatened or endangered plant species found growing in the lease tract. However, there are six noxious species found growing in the Powder River Resource Area, but it has not been determined if these species are found growing in the tract. The species are:		Low	Good May 16, 1980 Regional Director Region 6 U.S. FWS Denver, CO	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
	A. Convolulus aruensis B. Cirsium arvense C. Euphorbia esula D. Centaurea ropens E. Cardaria draba F. Centaurea maculosa				
Reclamation Vegetation	On federal, state and private lands, the Office of Surface Mining (OSM) assures that the mining company establishes a diverse, effective and permanent vegetative cover to standards set by the Department of State Lands of Montana and the Federal Bureau of Land Management	Low	High-failure of Reclamation Low-success of Reclamation	Good	

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COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
AGRICULTURE	2,484 acres suitable for cropland. 1,224 acres currently being cropped (167 acres, small grains; 1,057 tame pasture)	Maximum of 1,224 acres current cropland removed from production for term of mining and reclamation operations	High	Good	
LAND USE	Ranching is primary use of tract. 3 occupied dwellings on tract. Coal mines are located east and southeast of tract	Increase in present industrial activity. Loss of occupied dwellings. More land used for mines, roads, and powerlines.	Low to moderate during mining. Low to none after reclamation	Good	
WILDLIFE					
Raptors	Migrate through and nest in area of tract	Disturbance of nests near tract	Low	Good	
Sharp-tailed Grouse	One lek over federal coal	Destroy lek-mitigation necessary	Low-with mitigation	Good	
Threatened & Endangered Species	None on tract	None		Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
CULTURAL RESOURCES	4,239 acres inventoried to nominal Class III standards; 20 sites located, 13 on federal mineral	Disturbance and destruction of all sites within mine area, indirect effects to sites adjacent.	Loss of resource; loss of Heritage values	Data expected to be fair; some portions inventoried in different years	Undeter. sites need to be tested for NRHP eligibility
RECREATION	Area lacks recreational developments. Hunting is probably the only recreation activity on this tract.	Loss of wildlife habitat will affect hunting	Low	Acceptable	
VISUAL RESOURCES	Area is rated as Class IV	Classification would change to Class V during life of mine	Effect would be high during life of mine. Reclamation would restore tract to Class IV when mining has ended	Acceptable	
AIR QUALITY	Concentration of particulates estimated at 20 mcg/m^3 (MT standard is 75 mcg/m^3)	Highest ambient concentration of particulates would be 31 mcg/m^3 for Colstrip's Area C Block 1. Mining this tract would result in additional increases.	Minor	Fair	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP AREA C COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
NOISE	Typically rural with occasional blasting noise. Estimated noise level 29 dBA	Substantial increase in noise due to blasting, equipment, and more vehicle and railroad traffic. Combined noise level of about 98.3 dBA at 50 ft; would be attenuated with distance	Insignificant	Good	Colstrip and N. Cheyenne Indian Reservation would not be adversley affected.
TRANSPORTATION	Existing access via gravelled county road. Moderate to high use and maintenance. 6 miles of gravelled county roads lie across tract	Increased traffic on gravel access road and on portions of Montana Route 39. Relocation of county roads	Low Moderate	Good	Conveyor system being developed for Colstrip Area C Block 1 mine would also be used for this tract, if mined. no additional impacts.

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
COLSTRIP C COAL LEASING TRACT

AGRICULTURAL ECONOMICS

Affected Community	Affected 1978 Element ($1000)	Anticipated Effect of Action	Assumptions	Significance of Effect
Rosebud County	Annual Agricultural Receipts $28,997	-$9,222	Assumes all 167 acres of wheat disturbed. Less than 1% of county agricultural production	Low
		-$42,750	Assumes all 1,710 AUMS are lost for life of mine. Less than 1% of county agricultural production	Low

EMPLOYMENT AND POPULATION

Element	Affected Community	Affected Action	Significance of Effect	Data Reliability
Employment	Rosebud County	No change	None	Good
Population	Colstrip	No change	None	Good

UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

PART II

1984 Lease Sale — Coal

Summary Report — Colstrip Area C Tract
Northern Powder River Basin
Rosebud County, Montana

North Central Region
Billings, Montana

November 1, 1982

TRACT SUMMARY REPORT

Minerals Management Service, North Central Region
Billings District
Billings, Montana

Date: November 1, 1982

TRACT DESCRIPTION

Tract Name: Colstrip Area C No.:

Coal Region: Powder River

State: Montana County: Rosebud

BLM Resource Area and Planning Unit: Powder River RA; Colstrip Planning Unit

USGS Quadrangle Maps: McClure Creek, Rough Draw, Trail Creek School

Legal Description: See Attachment A and Attachment B (Tract Location Map)

Known Recoverable Coal Resource Area (KRCRA): Northern Powder River

Tract Acres (by BLM)

Federal Uncommitted:	1481
Federal Committed:	842
State:	76
Private (Fee):	2737
Total Tract:	5136

Approximate Acres Underlain by Coal:

Federal Uncommitted:	1347
Federal Committed:	665
State:	21
Private(Fee):	2206
Total Tract:	4239

Estimated In-Place Coal Tonnage:

Federal Uncommitted:	52.51 MMT
Federal Committed:	28.46 MMT
State:	.53 MMT
Private (Fee):	70.42 MMT
Total Tract:	151.92 MMT

Estimated Recoverable Coal Tonnage:

Federal Uncommitted:	33.58 MMT
Federal Committed:	20.98 MMT
State:	0.36 MMT
Private (Fee):	40.21 MMT
Total Tract:	95.13 MMT

ENTITIES EXPRESSING INTEREST

Western Energy Company

COAL RESOURCE CLASS DESIGNATION

CLASS 1: Good

Confidence in resource estimates is good because the surface areas of category "A" and "B" resources cover two-thirds or more of the total surface area of the tract

CLASS 2: Moderate

Confidence in resource estimates is moderate because the surface areas of category "A" and "B" resources cover one-third to two-thirds of the total surface area of the tract.

CLASS 3: Poor

Confidence in resource estimates is poor because the surface areas of category "A" and "B" resources cover one-third or less of the total surface area of the tract.

POTENTIAL FOR DEVELOPMENT OF TOTAL TRACT
Colstrip Area C Tract

EVALUATION FACTORS	CLASS 1	CLASS 2	CLASS 3
Coal Resources	X		
Coal Quality		X	
Transportation	X		
Minability	X		
Marketability	X		
Overall Class	X		

All in-place coal resources of the Colstrip Area C Tract meet demonstrated resources criteria as defined in U.S. Geological Survey Bulletin 1450-B. Extensive faulting, folding, or other geologic conditions that adversely impact minability are not known to occur in the tract area.

See Attachment C.

COAL RESOURCE CATEGORY DEFINITIONS

CATEGORY "A" RESOURCES

Resource quantity is estimated from data sources that are adequately spaced to assume, with a high degree of confidence, continuity between data points. The geologic character of the area is well defined.

CATEGORY "B" RESOURCES

Resource quantity is based on an assumption of continuity between data points with a lower confidence level than that of category "A" resources. The geologic character of the area is not as well defined as category "A" resources.

CATEGORY "C" RESOURCES

Resource quantity is based on an assumption of what can reasonably be expected to exist in the same producing region under analogous geologic conditions with a lower confidence level than that of either category "A" or "B".

POTENTIAL FOR DEVELOPMENT OF TOTAL TRACT

TOTAL IN-PLACE TONNAGE OF COLSTRIP AREA C TRACT

Coal Bed	Average Thickness	Resources (million short tons)		
		Category A	Category B	Category C
Rosebud	23.6	138.93	---	---
McKay	7.4	12.99	---	---

Coal resources were calculated using the accepted unit weight of 1770 tons per acre-foot for subbituminous coal.

IN-PLACE TONNAGE - FEDERAL UNCOMMITTED

TRACT: Colstrip Area C

Coal Bed	Average Thickness	Resources (million short tons)		
		Category A	Category B	Category C
Rosebud	24.3	49.80	---	---
McKay	7.3	2.71	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

IN-PLACE TONNAGE - FEDERAL COMMITTED

TRACT: Colstrip Area C

Coal Bed	Average Thickness	Resources (million short tons) Category A	Category B	Category C
Rosebud	23.4	27.52	---	---
McKay	8.3	.94	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

IN-PLACE TONNAGE - STATE

TRACT: Colstrip Area C

Coal Bed	Average Thickness	Resources (million short tons) Category A	Category B	Category C
Rosebud	22.5	.40	---	---
McKay	6.75	.13	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

IN-PLACE TONNAGE - PRIVATE (FEE)

TRACT: Colstrip Area C

Coal Bed	Average Thickness	Resources (million short tons) Category A	Category B	Category C
Rosebud	23.1	61.21	---	---
McKay	7.3	9.21	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

OVERBURDEN/INTERBURDEN THICKNESS RANGES

The following coal beds are listed in descending order:

Rosebud	- Min.	0 feet	Max. 345 feet	overburden
McKay	- Min.	50 feet	Max. 120 feet	interburden

COAL GEOLOGY OF THE COLSTRIP AREA C TRACT

All rocks exposed in the Colstrip Area C Tract belong to the Tongue River Member of the Fort Union Formation (Paleocene). Alluvium deposits (Quaternary) of varying thicknesses are present in the drainages found throughout the tract area. The Colstrip Area C Tract is situated on the northwestern flank of the Powder River Basin. Regional dips are southeasterly at inclinations of less than one degree.

The two coal beds of interest in the Colstrip Area C Tract are the Rosebud and McKay beds. The Rosebud bed is the more economically important coal bed in the tract area having an average thickness of 23.6 feet. Tract thicknesses range from 21 to 29 feet. Outcrops of the Rosebud bed are rare as the bed is burned extensively along its outcrop in the tract area. The McKay bed occurs 50 to 120 feet below the Rosebud bed in the Colstrip Area C Tract. The average thickness of the McKay bed is 7.4 feet within the tract boundary. Tract thicknesses for the McKay seam range from 6 to 8.5 feet. The McKay bed does not outcrop in the Colstrip Area C Tract.

No potential geologic hazards are known to exist in tract area. Small normal faults having throws of less than 50 feet are noted throughout the Colstrip area and may be present in the Colstrip Area C Tract.

References: U.S. Geol. Survey Bulletin 812-A; U.S. Geol. Survey Bulletin 847; Montana Bureau of Mines and Geology Bulletin 91; and Montana Bureau of Mines and Geology Chart GM-8.

COAL QUALITY - FEDERAL UNCOMMITTED
COLSTRIP AREA C TRACT
(Values in percent, except BTU)

Coal Bed	Number of Samples	Moisture	Volatile Matter	Fixed Carbon	Ash	Sulfur	BTU/lb
Rosebud	39	25.43	28.29	36.46	9.83	0.94	8,411
McKay	36	25.81	27.27	37.87	9.05	1.41	8,415

Rank of coal: Subbituminous
Minor and trace element content: Sodium oxide (Na_2O) occurrence in the McKay bed averages 2.38 percent of ash.

COAL QUALITY - TOTAL TRACT

Moisture 25.99%; Volatile Matter = 28.94%; Carbon = 35.12%; Ash = 9.89%
Sulfur = 0.88%; BTU/lb = 8,377 (Rosebud bed only).

POTENTIAL USE OF COAL: Electrical generation

TRANSPORTATION:

	Mode	Distance to Transportation Link
Existing	Railroad	6 miles
Being Developed	Conveyor Belt System	4 miles
Being Planned		
None Planned		

MINABILITY:

Type of Mine: Surface dragline operation.
One recoverable seam.

Estimated Recovery:

Based on current practices in the Powder River Basin coal region, a recovery factor of 90 percent is typical.
However, this percent recovery may or may not be attained.

Estimated Annual Production:

Federal Uncommitted: 2.0 million tons

Total Tract: 5.5 million tons

Estimated Mine Life: 17 years

Estimated Surface Acres to be Mined Per Year:

Federal Uncommitted: 50

Total Tract: 118

Active, Inactive, and Abandoned Mines or Leases in Tract Vicinity:

The Colstrip Mine is located 6 miles to the east and Big Sky Mine 8 miles to the southeast.

TRACT LEGAL DESCRIPTION

COLSTRIP AREA C

Principal Meridian, Montana

FEDERAL UNCOMMITTED	Acres
T. 1 N., R. 39 E.,	
sec. 2, S1/2NW1/4.	80
T. 1 N., R. 40 E.,	
sec. 6, lots 1 to 4, inclusive, S1/2N1/2, and S1/2.	681
T. 2 N., R. 39 E.,	
sec. 34, W1/2SW1/4.	80
T. 2 N., R. 40 E.,	
sec. 32, All	640
Total	1,481

FEDERAL COMMITTED	
T. 1 N., R. 39 E.,	
sec. 2, lots 1 to 4, inclusive, and S1/2NE1/4.	281.8
T. 2 N., R. 39 E.,	
sec. 34, N1/2, E1/2SW1/4, and SE1/4.	560
Total	841.8
Rounded Total	842

PRIVATE	
T. 1 N., R. 39 E.,	
sec. 1, lots 1 to 4, inclusive, S1/2N1/2, and SE1/4;	521.84
sec. 3, lots 1 and 2 and S1/2NE1/4.	180.17
T. 1 N., R. 40 E.,	
sec. 5, lots 1 to 4, inclusive, S1/2N1/2, and S1/2.	678.4
T. 2 N., R. 39 E.,	
sec. 35, S1/2NW1/4 and S1/2.	400
T. 2 N., R. 40 E.,	
sec. 29, S1/2S1/2;	160
sec. 31, lots 3 and 4, E1/2, and E1/2SW1/4;	476.85
sec. 33, W1/2.	320
Total	2,737.26
Rounded Total	2,737

STATE COMMITTED	
T. 2 N., R. 39 E.,	
sec. 36, lots 3 and 4.	75.53
Rounded Total	76
Tract Total	5,135.59
Rounded Tract Total	5,136

Attachment B

TRACT MAP
-Colstrip Area C-

Please see the tract map at the beginning of Part I.

DETERMINATION OF CLASSES
Colstrip Area C Tract

Coal Quality

Analyses of the Rosebud coal seam indicate that the BTU content is acceptable but in the low range for Powder River Basin coals. The Rosebud seam in this tract also has moderately high percent sulfur and ash contents. When compared to other Powder River Basin coals its quality is Class 2; however, it is still marketable. At this time the McKay seam in unmarketable but it is conceivable that sometime in the future it may be salable.

Transportation

The tract lies approximately 6 miles west of Western Energy's Rosebud Mine Area A and B railspur and loadout facility. The Area C Mine is serviced by a conveyor belt system beginning 4 miles east of the tract and running to the Colstrip power plants 3 and 4. As the tract is located near two forms of transportation, a Class 1 rating was applied for this category.

Minability

In regard to maximum stripping ratio, this tract is comparable with other operations in the area. A single recoverable seam is also attractive from a mining standpoint. Therefore this tract was given a Class 1 minability rating.

MINING ENGINEERING
DEFINITIONS AND ASSUMPTIONS
- Colstrip Area C Tract -

Deductions from the in-place resource were made for buffer zones and high-wall reduction zones. A recovery factor of 90 percent was then applied to the minable resource to determine the recoverable resource.

The rating for transportation was determined from the following table:

Rating	Distance to Established Transportation Link
Good	0-7 miles
Moderate	7-15 miles
Poor	15- miles

For a tract with more than one minable seam a weighted average proximate analysis was figured for the tract. The tract's proximate analysis was then compared to analyses from other marketed coals in the area for rating purposes.

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